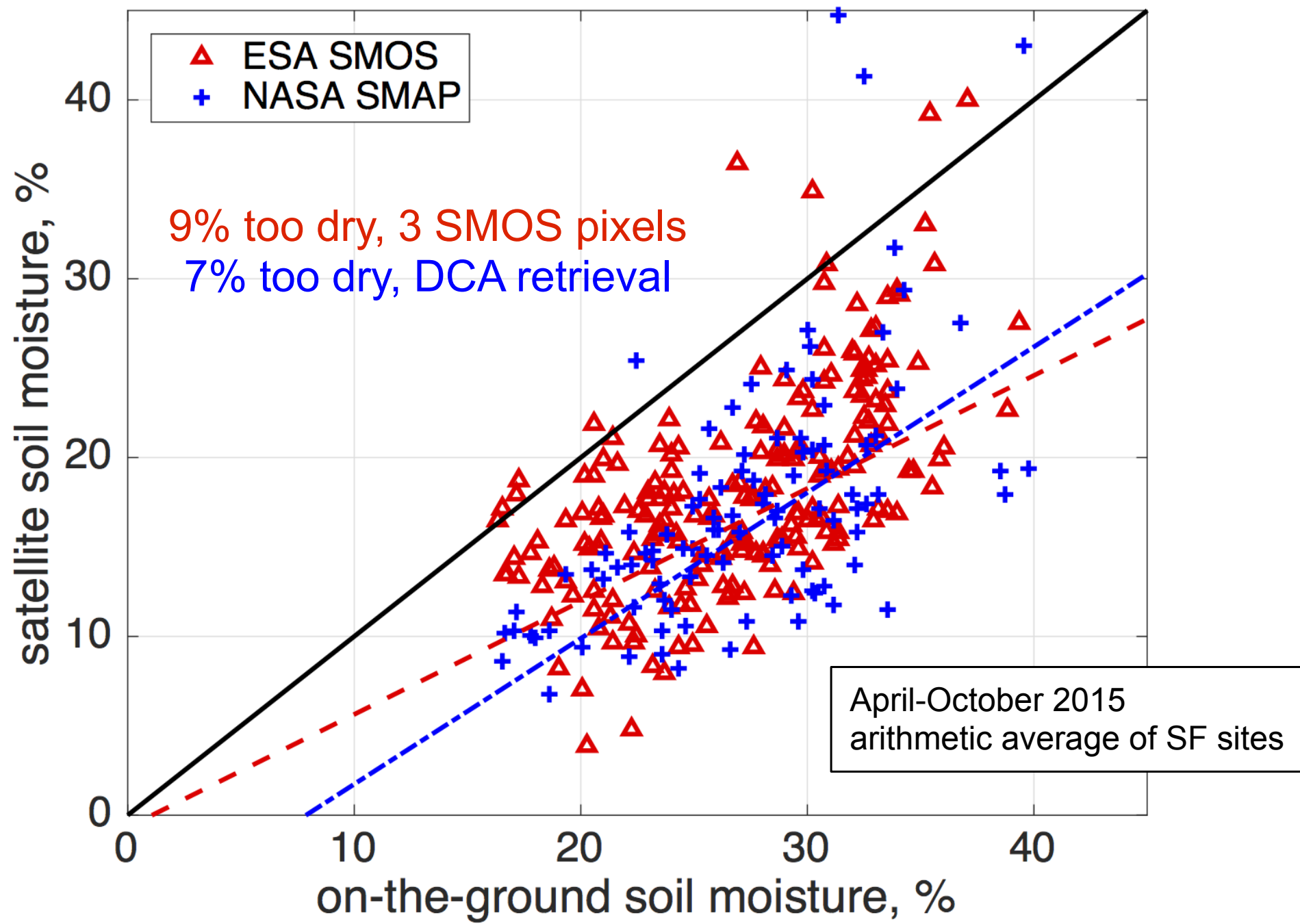


# **Why is SMOS/SMAP “Too Dry” in the South Fork and Other Agricultural Regions?**

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**Why is SMOS dry compared to soil moisture observed by the South Fork in situ  
soil moisture network?**

by

**Walker, 2016**

**Victoria A. Walker**

A thesis submitted to the graduate faculty  
in partial fulfillment of the requirements for the degree of  
**MASTER OF SCIENCE**

Major: Agricultural Meteorology

# Explanations: Not likely.

Bias in SMAP top-down versus in situ at depth?

No, mismatch affects noise not bias (Rondinelli et al., 2015).

Soil texture?

No, clay content in STATSGO soil map used by SMAP and now also by SMOS has less clay than FAO map previously used by SMOS. SMOS dry bias got worse (Walker, 2016).

Dielectric model?

Mironov, Wang & Schmugge both wetter than Dobson (Walker, 2016).

Radio frequency interference (RFI)?

No, SMOS not affected by RFI (Walker, 2016), so SMAP will not be.

Calibration of in situ probes? Upscaling approach for in situ probes?

## Explanations: Possible.

“b-parameter?” Spatial heterogeneity?

Relationship between TB and soil moisture nearly linear for both corn and soybean, not much else in South Fork.

Test using IOP2 data.

One goal of Hornbuckle SUSMAP grant is to quantify “b-parameter.”

Source of temperature data? Assuming  $T_s = T_v$ ? Temperature model?

Not likely. For soil, ECMWF error too small, usually opposite sign of what needed to correct bias (Walker, 2016).

Difference between  $T_s$  and  $T_v$  small (Hornbuckle and England, 2005).

SMAP auxiliary temperature and PALS TIR should be investigated.

Soil emission model?

Role of residue (vegetation matter left after harvest) likely important.

## Explanations: Most likely.

### Vegetation model?

Scattering significant in corn (Hornbuckle et al., 2003).

Soil moisture sensitivity in corn greater than predicted by  $\tau$ - $\omega$  model (Hornbuckle and England, 2004).

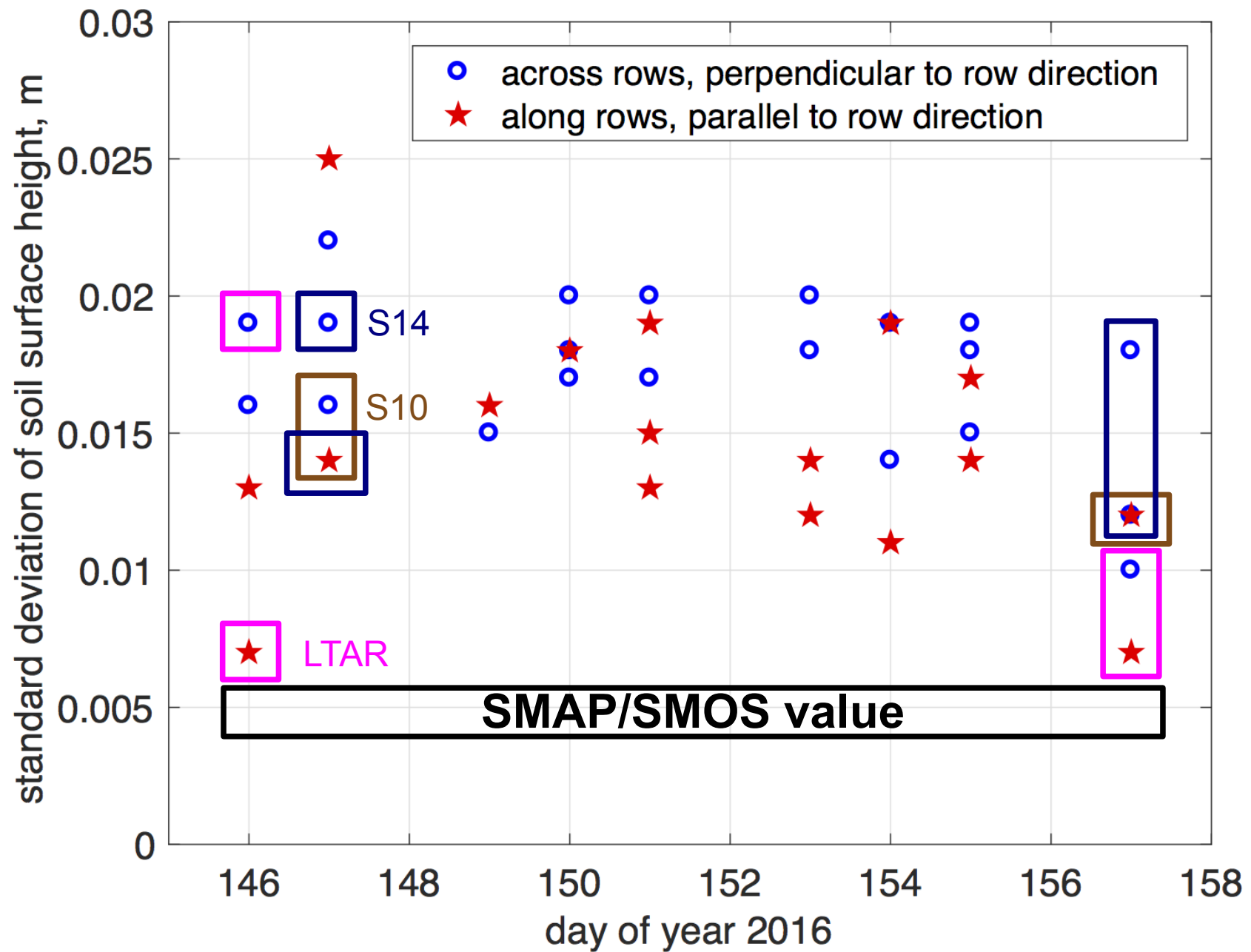
Changing  $\omega$  from 0 to 0.05 increased SMOS dry bias (Walker, 2016).

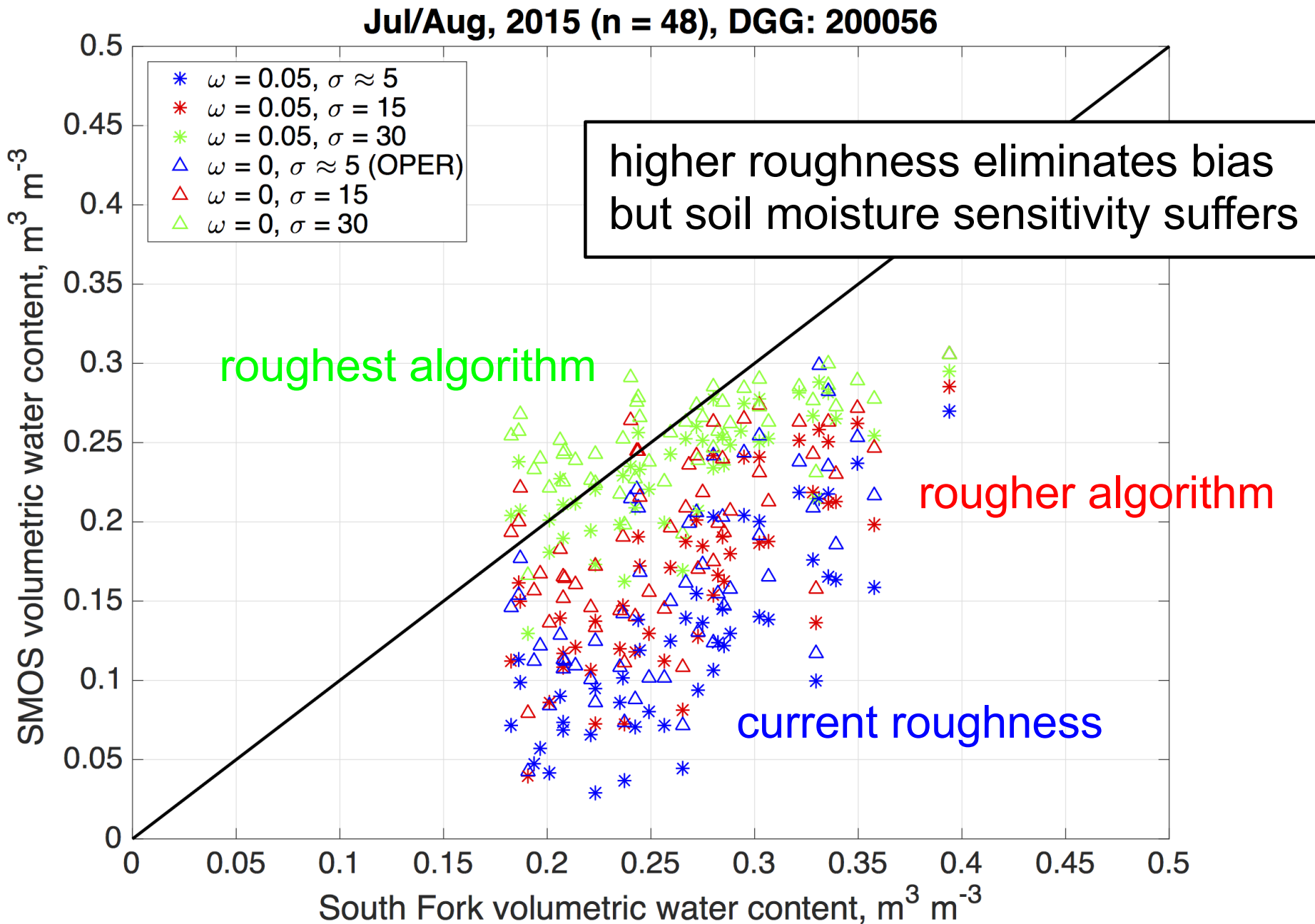
### VWC climatology versus actual?

### Alternative $\tau$ estimates?

### Soil surface roughness?

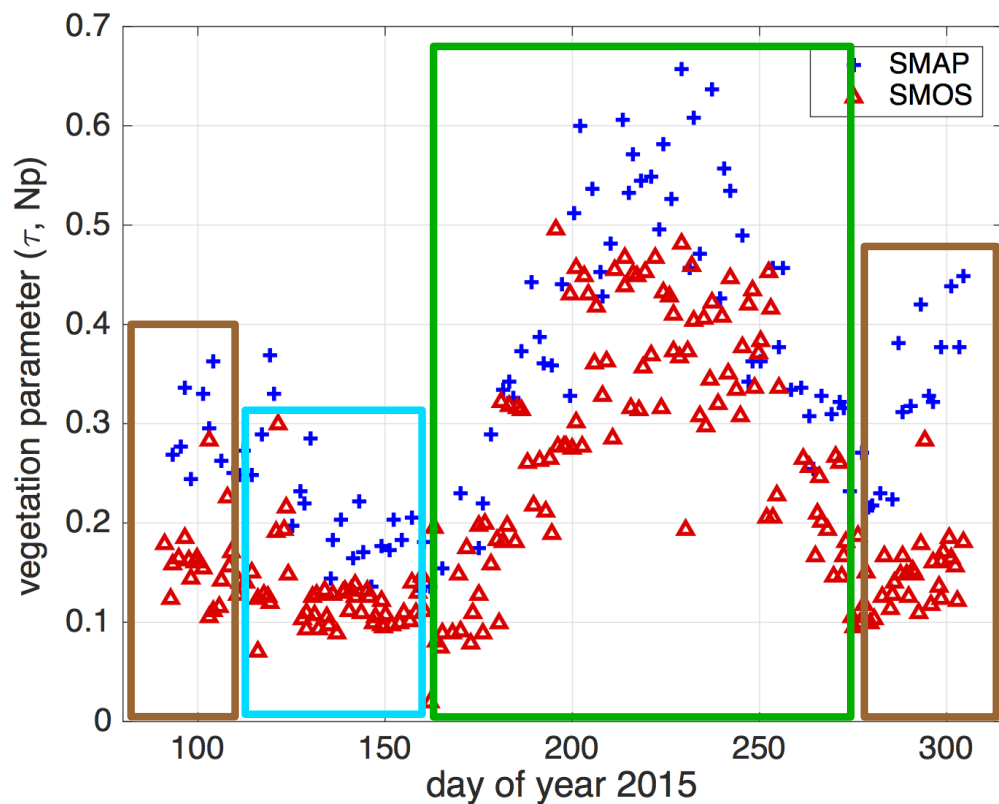
Walker NASA fellowship work.



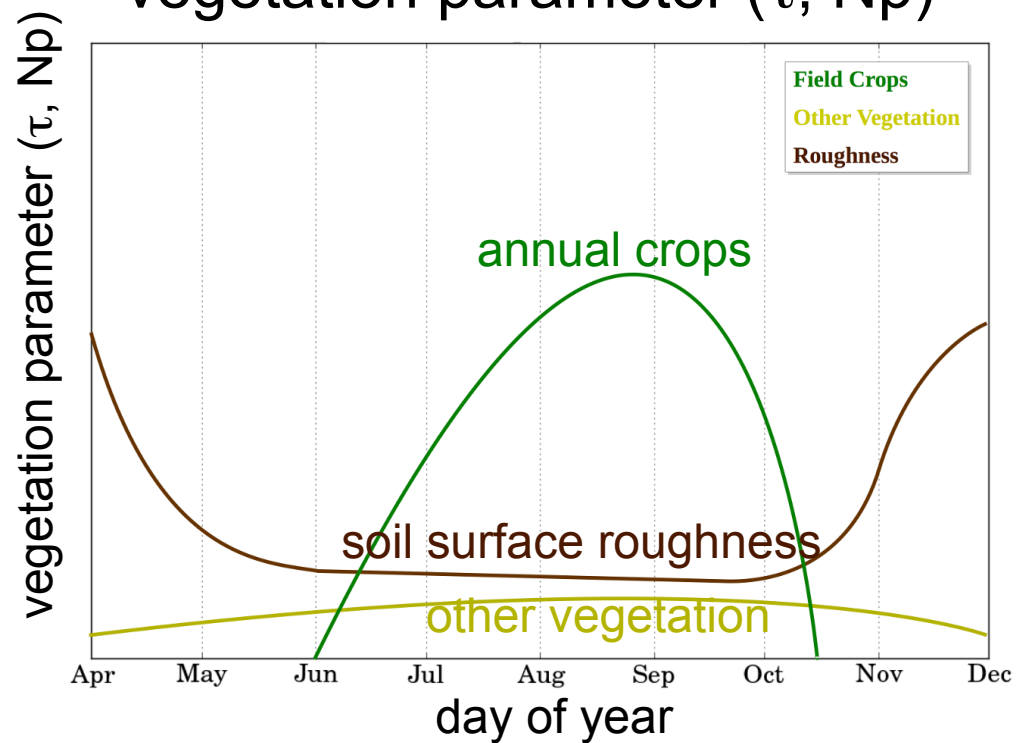


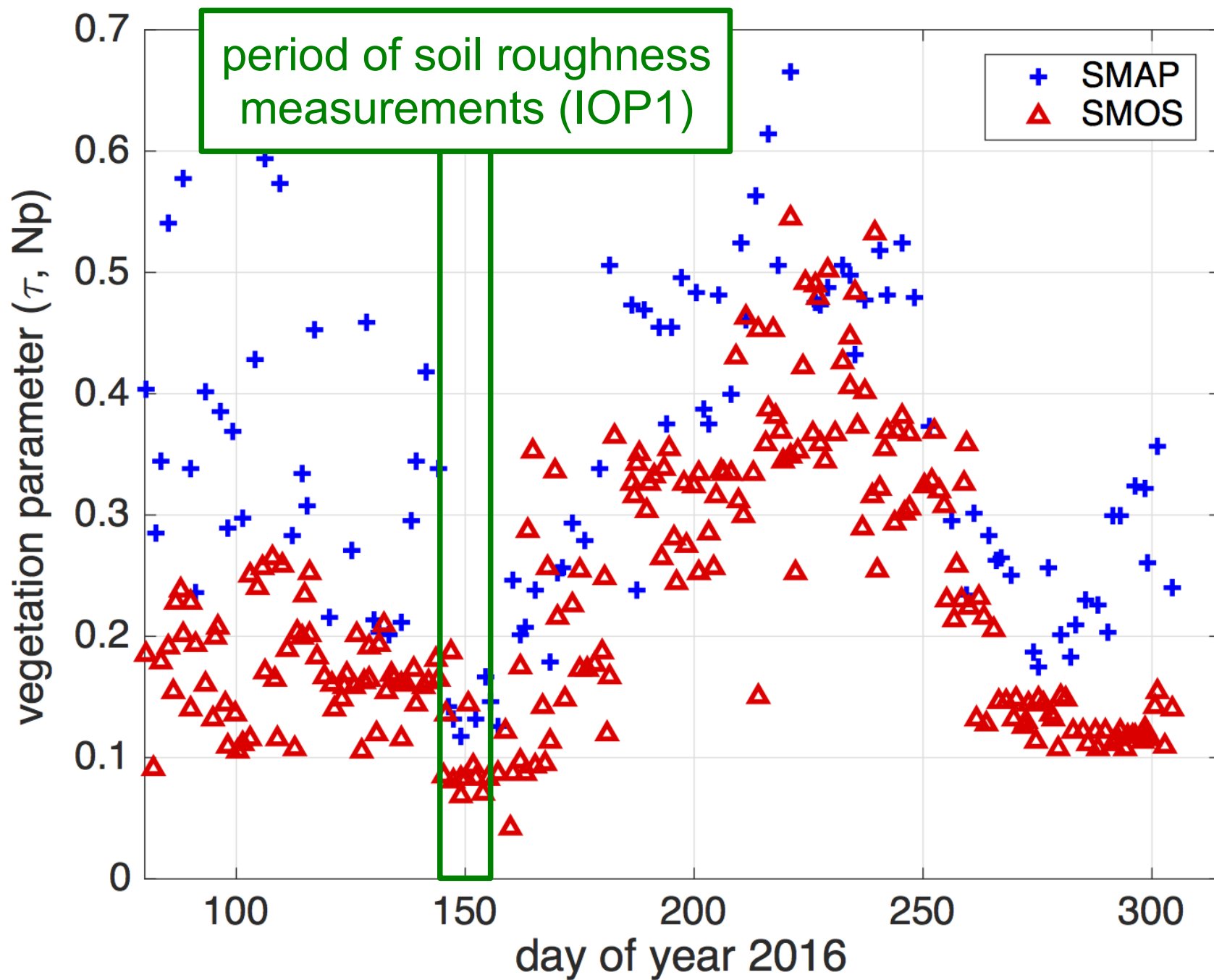


## vegetation parameter ( $\tau$ , Np)

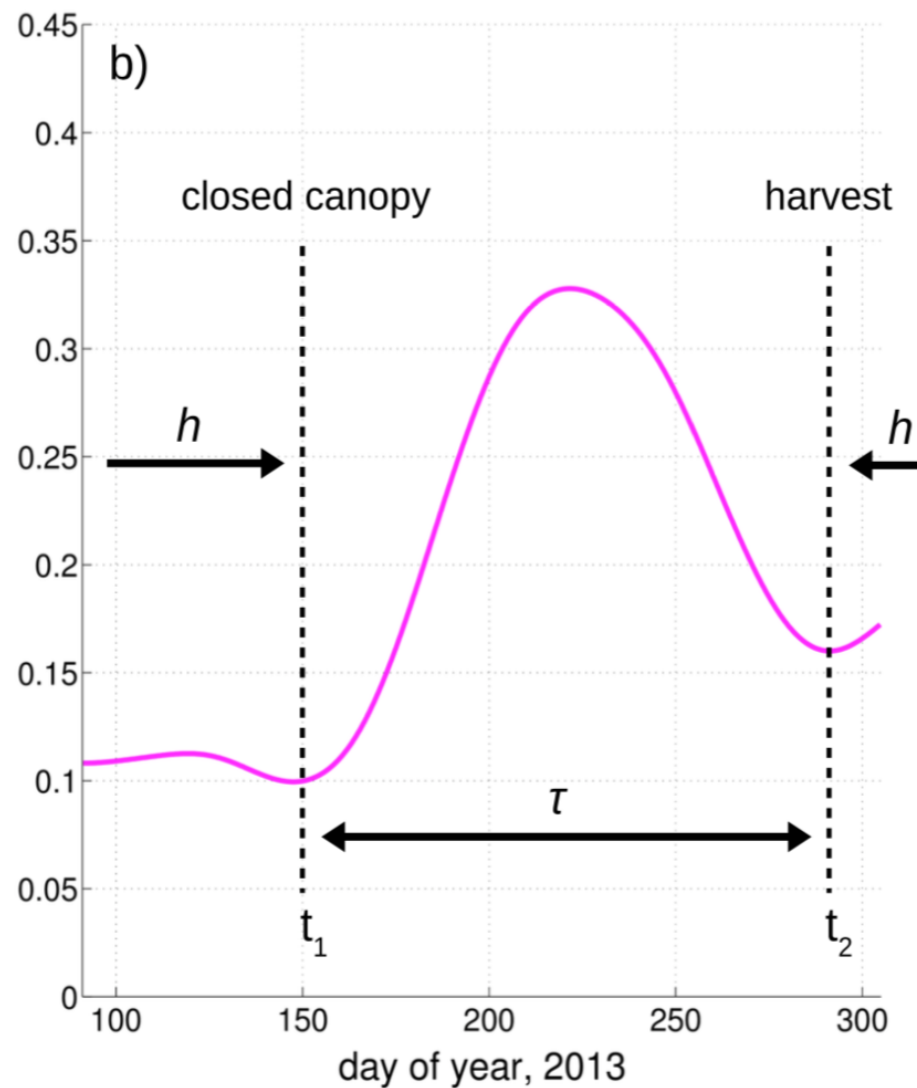
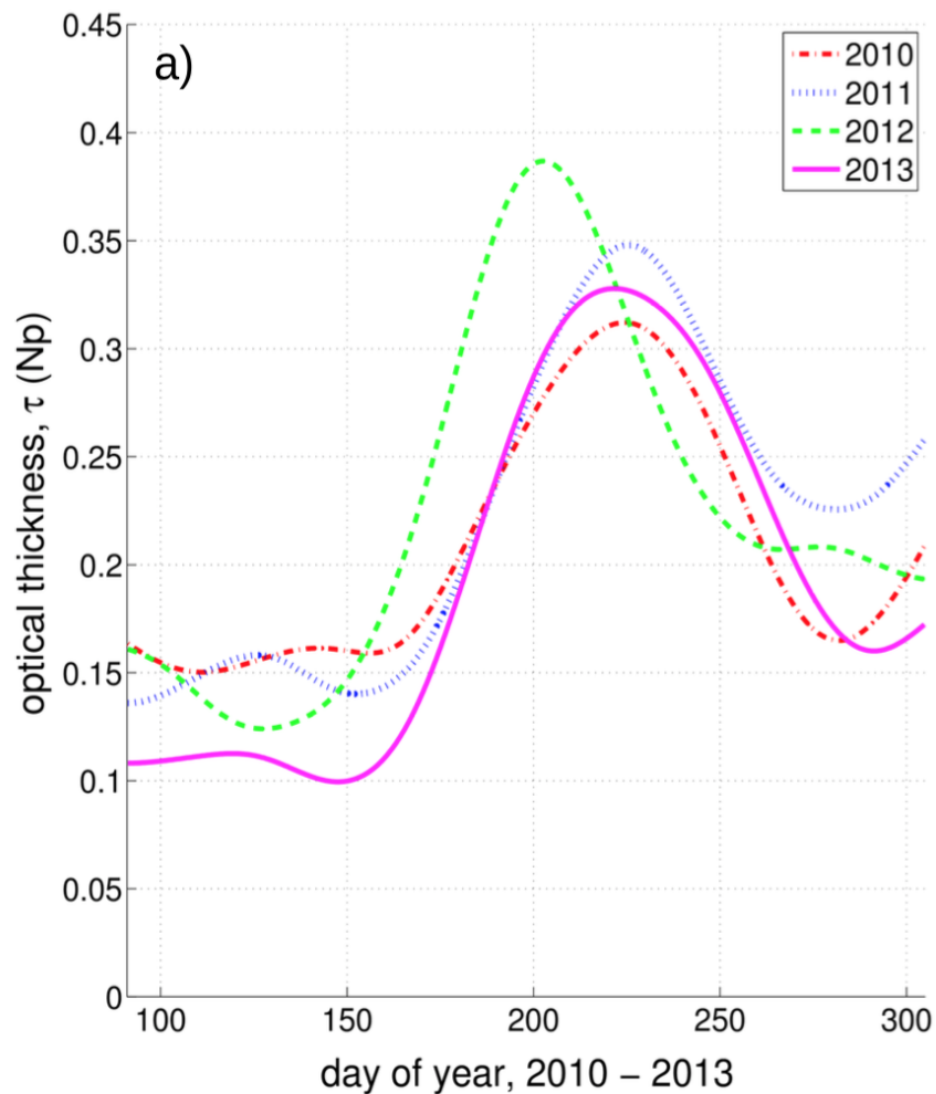


## conceptual understanding of vegetation parameter ( $\tau$ , Np)





## Walker NASA fellowship proposal...



## Explanations to investigate...

VWC climatology versus actual? Alternative  $\tau$  estimates?

Continue to leverage retrieved  $\tau$  from SMAP DCA.

Vegetation model? “b-parameter?”

Test a first-order  $\tau$ - $\omega$  model for corn with Florida tower data.

Soil emission model? Soil surface roughness?

Role of residue (vegetation matter left after harvest) likely important.

Source of temperature data? Assuming  $T_s = T_v$ ? Temperature model?

SMAP auxiliary temperature and PALS TIR should be investigated.